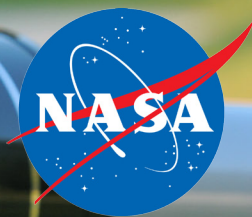


National Aeronautics and Space Administration



goddardview

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Robert H. Goddard Awards

By Lori Moore

On September 8, 2010, the Office of Human Capital Management (OHCM) hosted the annual Robert H. Goddard Awards ceremony. Award recipient's family, friends, colleagues, and management joined in the "i am **goddard**"-themed celebration of approximately 120 award recipients across 15 different award categories.

Individuals and teams were honored for their contributions that significantly impacted the achievements of the Center's scientific, technical, and institutional capabilities and enhanced mission performance. Special recognition was also given to the Standing Awards Committee, the body of individuals responsible for reviewing the Center's grass roots level nominations.

After the ceremony, award recipients were then invited to the offsite reception held at Martins Crosswinds conference center in Greenbelt, Md. There, guest speaker Frank Cepollina gave "A Tribute to Innovation and Ingenuity," highlighting Goddard's past, present, and future impact on the world.



Photo credit: NASA/Goddard/Pat Izzo

Caption: Frank Cepollina speaks to recipients of the Robert H. Goddard award.

For a list of Award Recipients individual and team names, please visit: <http://ohcm.ndc.nasa.gov/participants-nasa/Recipients/home.htm>.

For more information on the "i am **goddard**" campaign, visit: <https://internal.gsfc.nasa.gov/web/community/iamgoddard>. ■

GoddardView

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Cover caption: A student gets a first-hand look at a piece of Moon rock at the Goddard Visitor Center during International Observe the Moon Night.

Photo credit: NASA/Goddard/Debora McCallum

GoddardView Info

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Deadlines: News items for publication in the Goddard View must be received by noon of the 1st and 3rd Thursday of the month. You may submit contributions to the editor via e-mail at john.m.putman@nasa.gov. Ideas for new stories are welcome but will be published as space allows. All submissions are subject to editing.

Observe the Moon Night Goes Global

By Christina Coleman

On September 18, 2010 the world joined the Goddard Visitor Center, as well as other NASA Centers, to celebrate the first annual International Observe the Moon Night (InOMN). Over 400 people attended the Goddard event.

"InOMN provides the opportunity for the general public, our partners, and amateur astronomers to learn about lunar science and to view the Moon—many for the first time—through telescopes," said Brooke Hsu, the Education and Public Outreach lead for the *Lunar Reconnaissance Orbiter* (LRO) at Goddard and Principle Investigator for InOMN.



Photo credit: NASA/Goddard/Debra McCallum

Caption: Scientists, staff, and astronomers gather to talk all things lunar at International Observe the Moon Night.

What started as a celebration of LRO's successful journey to orbit around the Moon last August has grown into an astronomical event this year. After LRO's launch, Goddard's Education and Outreach Team hosted an event called, "We're at the Moon!" The same day, the event "National Observe the Moon Night," was hosted at Ames Research Center (ARC) in Moffett Field, Ca. by the Lunar Crater Observation and Sensing Satellite (LCROSS) and NASA Lunar Science Institute (NLSI) teams. This year, the teams decided to expand the event by partnering with other NASA institutions, organizations, and communities around the world.

"The goal of both of these events was similar: engage the local public and amateur astronomer communities in an event to raise awareness of NASA's involvement in lunar research and exploration. The events were so successful; we decided to do it again. Only better and much, much bigger," said Doris Daou, the Director of Communications and Outreach for NLSI.

The event was held from 6:30 p.m.–10:00 p.m. and was free to the public. Guest speakers and astronomers discussed lunar science and visitors were able to participate in hands-on activities using binoculars and amateur astronomy telescopes. There were also activities that studied lunar craters and topographic maps of the Moon.

During the evening, there were numerous tours to the nearby Goddard Geophysical and Astronomical Observatory's laser ranging facility. There was also a public unveiling of new LRO images and presentations on the

memorizing Science on a Sphere globe at the Goddard Visitor Center. As a treat for the visitors, the popular Moon Pie snacks were available to round out the theme of the night.

"I think the event was extremely successful. We've heard from numerous people how much they enjoyed meeting and chatting with all of the scientists and engineers that volunteered to staff the event, especially since many of them had worked on LRO when it was being built at Goddard," said Lora Bleacher, one of the coordinators for the event.

"Another plus was being able observe Jupiter and Uranus in addition to the Moon," she added.

Partnering with Astronomers Without Borders, Hsu and her team were able to advertise to many U.S. amateur astronomers who then shared their links to international astronomers. In all, there were 278 InOMN events globally. China, Germany, Egypt, and at least 39 other countries participated in the festivities. Among the NASA Centers, Marshall Space Flight Center in Huntsville, Al. was also included.

Daou hopes that the huge effort engages the public in science and incites and encourages their interest in what science generally, and lunar science specifically, is achieving these days.

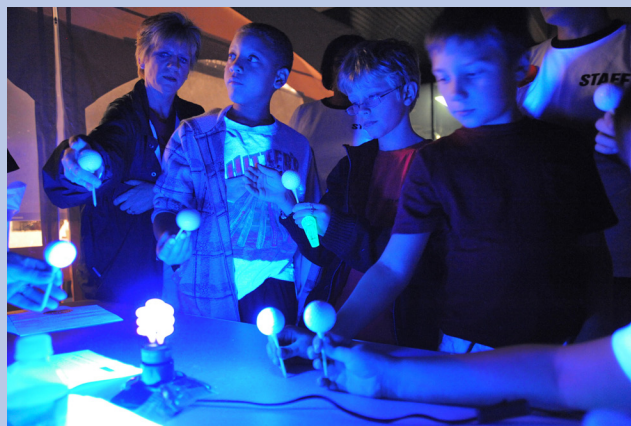


Photo credit: NASA/Goddard/Debra McCallum

Caption: Students are shown how the Moon and Sun interact in a black light demo.

"The Moon has been the first stop in humanity's effort to know more and explore our universe. It has provided us with so much knowledge, but there is so much more to know about it," she added.

For more information, visit: <http://observethemoonnight.org>.

For a schedule of the events at the GSFC Visitor Center visit: <http://www.nasa.gov/centers/goddard/visitor/events/observe-the-moon.html>.

For more information on LRO visit: www.nasa.gov/lro. ■

Webb Telescope Unique Structural “Heart” Passes Extreme Tests

By Lynn Chandler

NASA engineers have created a unique engineering marvel called the Integrated Science Instrument Module Flight Structure. The structure recently survived exposure to extreme cryogenic temperatures, proving that the structure will remain stable when exposed to the harsh environment of space. The material that comprises the structure, as well as the bonding techniques used to join its roughly 900 structural components, was all created from scratch.

The ISIM will serve as the structural “heart” of the *James Webb Space Telescope*. The ISIM is a large, bonded composite assembly made of a lightweight material that has never been used before to support high precision optics at the extreme cold temperatures that will be experienced by the *Webb* observatory.

Imagine a place colder than Pluto where rubber behaves like glass and where most gasses become liquid. The place is called a Lagrange point and is nearly one million miles from Earth, where the *Webb Telescope* will orbit. At this point in space, the *Webb Telescope* can observe the whole sky while always remaining in the shadow of its tennis-court-sized sunshield. *Webb’s* components need to survive temperatures that plunge as low as -411 degrees Fahrenheit (27 Kelvin). It is in this environment that the ISIM structure met its design requirements during recent testing. “It is the first large, bonded composite spaceflight structure to be exposed to such a severe environment,” said Jim Pontius, ISIM lead mechanical engineer at Goddard.

The passage of those tests represent many years of development, design, analysis, fabrication, and testing for managing structural-thermal distortion.

The ISIM structure is unique. When fully integrated, the roughly 7 feet (2.2 meter) ISIM will weigh nearly 2,000 lbs. (900 kg) and must survive more than six and a half times the force of gravity. The ISIM structure holds all of the instruments needed to perform science with the *Telescope* in very tight alignment. Engineers at Goddard had to create the structure without any previous guidelines. They designed this one-of-a-kind structure made of new composite materials and adhesive bonding technique that they developed after years of research.

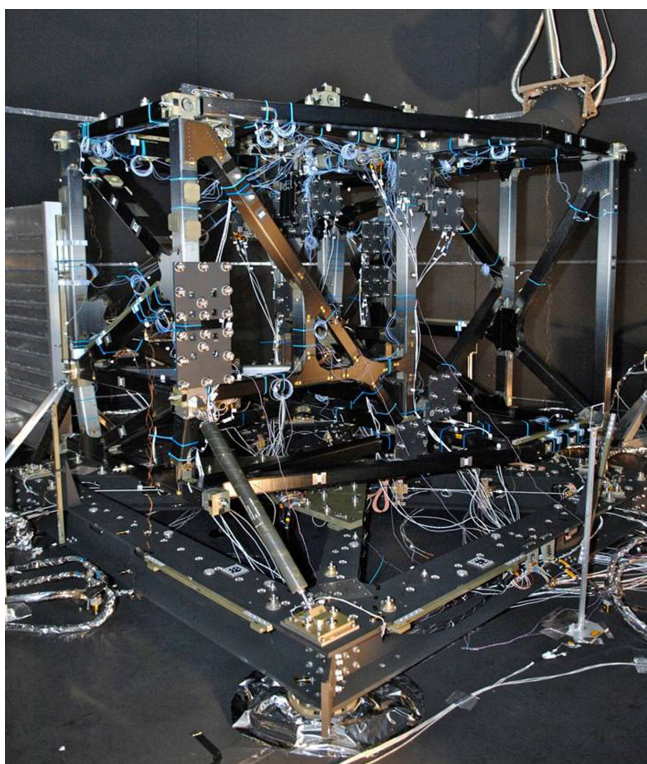
The Goddard team of engineers discovered that by combining two composite fiber materials, they could create a carbon fiber/cyanate-ester resin system that would be ideal for fabricating the structure’s 3 inch (75 mm) diameter square tubes. This was confirmed through mathematical computer modeling and rigorous testing. The system combines two currently existing composite materials—T300 and M55J—to create the unique composite laminate.

To assemble the ISIM structure, the team found it could bond the pieces together using a combination of nickel-iron alloy fittings, clips, and specially shaped composite plates joined with a novel adhesive process, smoothly distributing launch loads while holding all instruments in precise locations—a difficult engineering challenge because different materials react differently to changes in temperature. The metal fittings also are unique. They are as heavy as steel and weak as aluminum, but offer very low expansion characteristics, which allowed the team to bond together the entire structure with a special adhesive system.

“We engineered from small pieces to the big pieces testing all along the way to see if the failure theories were correct. We were looking to see where the design could go wrong,” Pontius explained. “By incorporating all of our lessons learned into the final flight structure, we met the requirements, and test validated our building-block approach.”

The Mechanical Systems Division at Goddard performed the 26-day test to specifically test whether the car-sized structure behaved as predicted as it cooled from room temperature to the frigid—very important because the science instruments must maintain a specific location on the structure to receive light gathered by the *Telescope’s* 21.3 feet (6.5 meter) primary mirror. If the contraction and distortion of the structure due to the cold could not be accurately predicted, then the instruments would no longer be in position to gather data about everything from the first luminous glows following the Big Bang to the formation of star systems capable of supporting life.

The test itself also was a first for Goddard because the technology needed to conduct it exceeded the capabilities then offered at the Center. “The multidisciplinary (test) effort combined large ground-support equipment specifically designed to support and cool the structure, with a photogrammetry



Caption: The ISIM Structure in the vacuum in the NASA Goddard Space Flight Center Space Environment Simulator.

Photo credit: NASA/Goddard/Chris Gunn

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Webb Structural “Heart” Passes Extreme Tests

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measuring system that can operate in the cryogenic environment,” said Eric Johnson, ISIM Structure Manager at Goddard. Photogrammetry is the science of making precise measurements by means of photography, but doing it in the extreme temperatures specific to the *Webb Telescope* was another obstacle the NASA engineers had to overcome.

Despite repeated cycles of testing, the truss-like assembly designed by Goddard engineers did not crack. Its thermal contraction and distortion were precisely measured to be 170 microns—the width of a needle—when it reached -411 degrees Fahrenheit (27 Kelvin), well within the design requirement of 500 microns. “We certainly wouldn’t have been able to realign the instruments on orbit if the structure moved too much,” Johnson said. “That’s why we needed to make sure we had designed the right structure.”

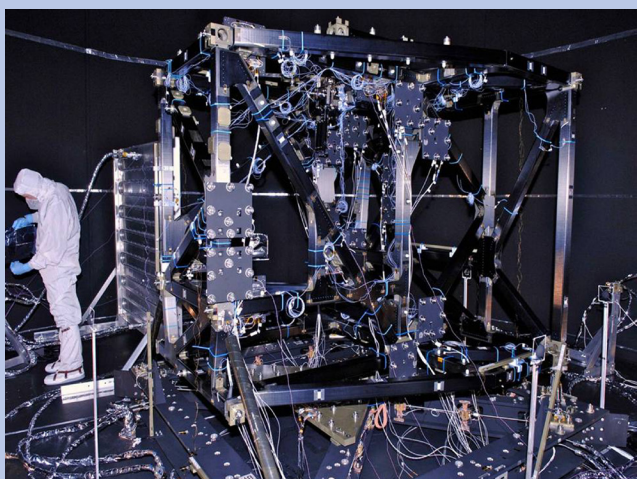


Photo credit: NASA/Goddard/Chris Gunn

Caption: Testing the Integrated Science Instrument Module (ISIM) Flight Structure.

The same testing facility will be used to test other *Webb Telescope* systems, including the telescope backplane, the structure to which the *Webb Telescope*'s 18 primary mirror segments will be bolted when the observatory is assembled.

For more about the technology and testing, visit: <http://www.nasa.gov/topics/technology/features/jwst-unobtainium.html>.

For more information about the *James Webb Space Telescope*, visit: <http://www.jwst.nasa.gov>. ■

NPP Climate Satellite Passes Pre-Environmental Review

By Cynthia M. O'Carroll

The *National Polar-orbiting Operational Environmental Satellite System* (NPOESS) Preparatory Project (NPP) climate and weather satellite has successfully completed its Pre-Environmental Review (PER) at Ball Aerospace and Technologies' production and test facility in Boulder, Colo., and will begin flight environmental testing in the upcoming weeks.

A group of multidisciplinary experts from NASA and NOAA, as well as a number of independent reviewers conducted the pre-environmental review of the five-instrument satellite. The review team assessed the satellite test activities completed to date, the completeness and adequacy of the environmental test plans, and determined the satellite is ready to proceed with its environmental test campaign.

“We are confident that the NPP satellite systems are robust and we are preparing the satellite to undergo rigorous environmental testing,” stated Ken Schwer, NPP Project Manager at Goddard.



Photo credit: Ball Aerospace

Caption: Technicians perform a pop-and-catch partial deploy of NPOESS Preparatory Project (NPP) satellite's solar array during this week's successful pre-environmental review in advance of flight environmental testing.

Environmental tests include vibration, acoustics, shock, electromagnetic interference and compatibility, and thermal vacuum, and are scheduled to begin in September. The launch is slated for October 2011.

The five-instrument suite includes: the Visible/Infrared Imager Radiometer Suite (VIIRS), the Cross-track Infrared Sounder (CrIS), the Clouds and the Earth Radiant Energy System (CERES), the Advanced Technology Microwave Sounder (ATMS), and the Ozone Mapping and Profiler Suite (OMPS). NPP's advanced visible, infrared, and microwave imagers and sounders will improve the accuracy of climate observations and enhance capabilities to the Nation's civil and military users of satellite data.

NPP is designed to provide continuity with NASA's Earth Observing System (EOS) satellites for climate observations and to provide the operational weather community with risk reduction for the next generation of weather satellites.

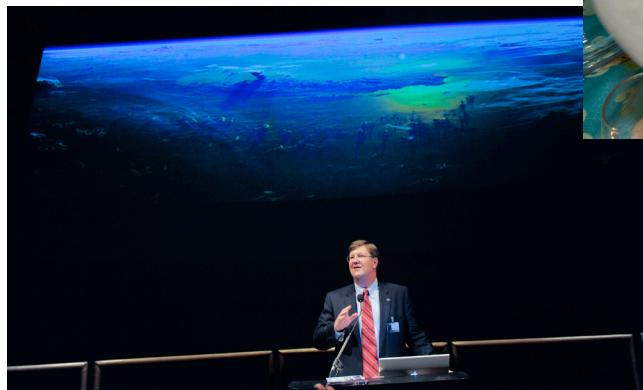
Goddard manages the NPP mission on behalf of the Earth Science Division of the Science Mission Directorate at NASA Headquarters. ■

Goddard Hosts 11th Annual Reception at National Air and Space Museum

Photos by Bill Hrybyk and Pat Izzo

On September 15, Goddard and the Maryland Space Business Roundtable hosted their 11th Annual Fall Reception and Program at the National Air and Space Museum in Washington, DC. NASA astronaut and STS-132 Mission Specialist, Dr. Piers Sellers, shared his personal experiences in space, guided guests through a decade's worth of Earth science and technology accomplishments from NASA's Earth Observing Fleet, and provided a glimpse into the future using climate models.

As a complement to Dr. Sellers' presentation, composer and musician Kenji Williams opened the evening's program by performing "Bella Gaia" against the backdrop of NASA imagery of Earth, allowing viewers to see our planet as NASA does, from orbit. ■



College Students Help Develop Small Satellite with Big Plans

By Lori Keesey

Satellites are big. They cost a lot of money. At least that's the impression a couple of University of Maryland-College Park students had when they applied for an internship to help construct a satellite instrument with scientists at Goddard. As the pair quickly discovered, nothing could have been farther from the truth.

To their astonishment, the satellite that Saman Kholdebarin and Lida Ramsey helped to develop was literally the size of a football. "I had no idea you could make these satellites so small," Kholdebarin said, recalling his surprise when his Goddard mentors explained the project to him. "I was astounded."

The small satellite, with a big mission, is appropriately named *Firefly*. Sponsored by the National Science Foundation (NSF), the pint-sized satellite will study the most powerful natural particle accelerator on Earth—lightning—when it launches from the Marshall Islands aboard an Air Force Falcon 1E rocket vehicle next year. In particular, *Firefly* will focus on Terrestrial Gamma-ray Flashes (TGFs), a little understood phenomenon first discovered by NASA's Compton Gamma-Ray Observatory in the early 1990s.

Although no one knows why, it appears these flashes of gamma-rays that were once thought to occur only far out in space near black holes or other high-energy cosmic phenomena are somehow linked to lightning.

Using measurements gathered by *Firefly*'s instruments, Goddard scientist Doug Rowland and his collaborators—Universities Space Research Association in Columbia, Md., Siena College, located near Albany, N.Y., and the Hawk Institute for Space Studies in Pocomoke City, Md.—hope to answer what causes these high-energy flashes. In particular, they want to find out if lightning triggers them or if they trigger lightning. Could they be responsible for some of the high-energy particles in the Van Allen radiation belts, which damage satellites? *Firefly* is expected to observe up to 50 lightning strokes per day, and about one large TGF every couple days.

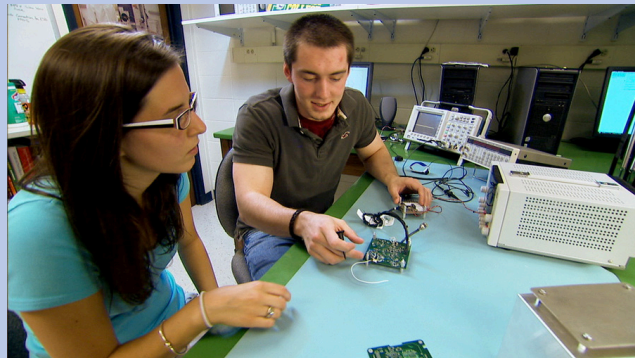
"The fact that they exist at all is amazing," said Rowland, who spearheaded the overall effort. "They shouldn't exist."

The first hurdle to solving the mystery was building the spacecraft and its two experiment packages for the budgeted amount of less than one million dollars, which is about 100 times less expensive than what full-sized satellite missions normally cost. With help from about 15 students from the University of Maryland-College Park, Siena College in Loudonville, N.Y., and other universities, Rowland and the *Firefly* team designed and integrated the spacecraft and its instruments. The team expects to ship the completed satellite to the Air Force sometime this fall in preparation for a March 2011 launch. Once deployed in its low-Earth orbit, *Firefly* will provide at least three months of data, with a goal of up to one year to maximize student involvement in operations and data analysis.

Work began on *Firefly* in 2008 after NSF selected the mission concept for support under its CubeSat program, which launches mini satellites as stowaways aboard rockets carrying larger satellites in space, rather than requiring dedicated rocket launches. *Firefly* is the second in a series of NSF-sponsored small satellites designed to study Earth's upper atmosphere.

"We really are doing cutting-edge science," said Al Weatherwax, a Siena College professor who partnered with Rowland to win the NSF grant to develop the *Firefly* mission. "We got the right people and it worked out great. This is the most fun I've had. I'll be sad to see it end. We're already talking about our next bunch of CubeSats."

Siena College built a number of spacecraft components, including one of *Firefly*'s two experiment packages, the Very Low Frequency (VLF) receiver/photometer experiment. This experiment combines multiple sensors to measure both VLF radio waves and optical light emitted by lightning. These measurements will corroborate the occurrence of lightning when the spacecraft observes gamma-ray flashes. "As a college, we are able to take advantage of educational discounts," Weatherwax said, explaining how his team accomplished its assignment on a shoestring budget. "Commercial vendors either donated or reduced the price of key components."



Caption: Jennifer Williams and Robert Carroll, physics students at Siena College Loudonville, N.Y., work on instrument electronics for *Firefly*.

The Goddard team built *Firefly*'s Gamma-Ray Detector (GRD) instrument, which will measure the energy and arrival times of incoming X-ray and gamma-ray photons associated with TGFs. Although Goddard scientist Joanne Hill designed the instrument, she assigned Ramsey and Kholdebarin the task of designing, building, and testing the instrument's power supply board, a component that monitors voltage levels that run the detector.

The experience was a memorable one for both Ramsey and Kholdebarin. Their electrical-engineering classes taught them the basics of circuit electronics, but they learned through trial and error that it takes more than textbook knowledge to build a satellite component. Under certain applications, one circuit might work better with another, Kholdebarin discovered.

"After doing this, I've become more confident," Ramsey added. "I can figure out anything after this. That's the best experience. You really can do a lot more than you think you're capable of." ■

Missions, Meetings, and the Radial Tire Model of the Magnetosphere

By Karen C. Fox

Tom Moore was recently named Project Scientist for the Magnetospheric MultiScale (MMS) mission, four spacecraft scheduled launch in 2014 to study magnetic reconnection—a crossing of magnetic field lines that can produce solar flares as powerful as a billion atomic bombs and is responsible for magnetic storms and auroras in Earth's atmosphere.



Caption: Tom Moore.

How did you get your start in Heliophysics?

I grew up in a blue-collar family and I didn't know what a scientist was for a long time. I could kind of see what an engineer was, so I started out as an electrical engineer. But there was some point in college...well, engineering was kind of hard. They wanted you to work ungodly hours or they were going to flunk you out. At some point along the way I read a line from Alan Watts that talked about how we don't come into the world from somewhere else, we come out of the world. We're the universe becoming conscious. It was a similar idea to Carl Sagan's point that we're all star stuff. After that I started reading about science more and switched to physics.

After I graduated, I started teaching, because it's hard to get a job in physics with only an undergraduate degree. One of the things I enjoyed most was explaining astronomy to students. Eventually, I realized that you have to have a graduate degree if you want to do research, so after three or four years of teaching, I quit and took off for grad school.

The way I got into this business, specifically, was because when you start trying to launch a career in space or astronomy you have to choose between astrophysics and the solar system. For me that was no contest because there's no known life out there in the stars, but there is in the solar system. So my interests are in what conditions are needed to make a planet friendly, to turn it into the kind of thing we have here on Earth.

What are some of the highlights of your career at Goddard?

When you get something—anything—that you worked with ready to go up. You watched it take shape and you helped design it and it actually does what you want it to do. It's just an incredible feeling. It's almost like you defied the odds. So many things can go wrong that you just feel jubilant when it goes right. Of course, it usually does go right, since people here are so careful. But it still feels like you're defying the odds.

And then it works. And you get data that makes sense. And you see things you never thought you were going to see. And there's the whole process of arguing over what you saw and how it makes sense and how it differs from what you thought you'd see. Then, writing it up is a long tedious process, of course, but it's really satisfying when you publish and everyone agrees that you've really got something there.

What is your role as Project Scientist for the MMS mission?

Basically, my role is to try to remind people why we're doing this mission. When push comes to shove and compromises have to be made, my real function is to keep everyone reminded about the science goals and how to achieve them given the resources we have. There are a million choices that have to be made to figure out how to perform the best science. And of course I have to go to plenty of meetings.

The science this mission will focus on is the study of magnetic reconnection. What is that?

I have a metaphor I use that I call "The Radial Tire Model of the Magnetosphere." Imagine a tire rolling down the street on a planet where the atmosphere has this weird property that it's laced with microscopic fibers—when it rains, the water runs down these fibers. Normally the tire rolls right through, the air and the fibers just separate around it. But the fibers have this weird property: under just the right conditions the fibers connect up with the radial plies of the tire in a solid way. Now, the tire is moving, but it's attached to the fibers in the atmosphere. These pull on the tire. They tear it apart from the outside, and destroy it.

This happens in Earth's magnetosphere. The magnetic field lines act like a connective tissue of fibers. Magnetic reconnection is when those fibers in the solar wind connect up to the magnetosphere and start yanking on it. The magnetosphere is standing still, and the solar wind is moving as fast as greased lightning—so it tears things apart, stirs the whole thing up, peels off outer layers, drags them down-stream. This causes auroras near Earth and is also the root cause of huge explosions around the Sun.

How does MMS study this?

Weather in space has two very localized small regions that control all of this reconnection: connection on the upstream side, and disconnection on the downstream side. You can think of them like the eye of a hurricane. A hurricane can be really big, but it has a teensy weensy eye and aircraft are

Photo credit: NASA/Goddard/Bill Hrybyk

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Missions, Meetings, the Tire Model of the Magnetosphere

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sometimes flown into the eye to find out what's going on in the storm. MMS is trying to find that tiny region. We're flying four spacecraft in formation right into the eye of the storm.

We've gone through these regions before, but so quickly that we barely spot them. We know there's something going on in there that we've never quite caught. Now we're going in with instruments that are like high speed cameras that can measure plasmas and magnetic fields and photons at 30 times per second. The plasma analyzer is 100 times faster than anything that has ever flown before.

MMS is certain to fly through the right place and we're going to see these regions for the first time. We're hoping to encounter those reconnection sites, or "diffusion regions" as they're sometimes called, dozens of times over the two and a half years of the mission.

How big are these two regions?

Each one is just a few kilometers across, about the size of Greenbelt. And the spacecraft are going by so fast—50 to 100 kilometers per second—that the region goes by in a tenth of a second. It's like trying to study Goddard from the *International Space Station* flying overhead at 10 km/s. By the time you've spotted it, you've gone by. But now we'll have those high speed cameras running. We'll still go by in a tenth of a second, but we'll get good movies of what's going on.

What information are you hoping MMS will provide about magnetic reconnection in those regions?

Basically, in my Radial Tire model, when I talk about "just the right conditions," the whole question is about what are those special conditions that make the magnetic lines connect up to the magnetosphere—what makes it connect at a particular place and at a particular time. At the most simple level, the special conditions could just be that a magnetic line crosses another one at the right angle, but things are hardly ever that simple.

There are widely different theories—some six or eight—with really fundamental differences between them. Are the boundary conditions important and the small-scale stuff takes care of itself? Or does the small-scale stuff turn the whole process on and off sporadically, like a valve that has its own mind? MMS has gone all out to have the instruments we need to really distinguish between these theories.

Reconnection is the most controversial theory I've been involved with in 35 years of my career. It's just been non-stop controversy the whole time, so it's really neat to think we might be able to figure it out. You get incredibly polarized positions: some say it's the fundamental process of the whole space weather system versus others who say it's a bunch of baloney. At this point, it's pretty much proven that magnetic reconnection exists and is real, but there's still a lot of controversy on how it works. We need to resolve it and this is the mission to do it. ■

Felipe Romo: A Long Way from Home

By Lynn Chandler

Felipe Romo is a Contract Specialist in Code 210.9. He is responsible for providing support to the *James Webb Space Telescope*. He is responsible for the Near Infrared Camera (NIRCam) Instrument contract with University of Arizona and the contract with the Space Telescope Science Institute for the ground support of the Science and Operations Center.

Felipe grew up in the very small town of Encarnacion de Diaz, Jalisco, Mexico. He came back to the United States in 1992 and, upon arrival, faced many challenges. The most significant of which was the language barrier. Other challenges included financial means to pursue higher education, military deployments, and family separation.



Photo credit: NASA/Goddard/Chris Gunn

Caption: Felipe Romo

Felipe was the first in his family to ever go to college and obtain a master's degree. Neither of his parents was able to finish grade school. Most of his family worked in construction. Wanting more out of life, Felipe joined the U.S. Army right after high school. He spent eight years in logistics and was deployed to Kuwait, Kosovo, and Qatar. After serving eight years in the Army, he transferred to a civilian position at Walter Reed Army Medical Hospital as a Supply Management Specialist.

While at Walter Reed, Felipe took advantage of the GI Bill and received a bachelor's degree in information technology and went on to get his master's degree in business administration. Felipe joined Goddard in April 2008 as a Contract Specialist in the Space Sciences Directorate before joining the *James Webb Space Telescope* program.

Felipe wanted to set an example for his family and others to set their dreams high and to work hard to achieve them. When asked who inspired him, Felipe says, "Many of my military leaders excelled and they inspired me to want to do better."

He added, "My work ethic comes from my father. Everything he did, he did it with excellence." His father was a very hard worker. Seeing this as a child has made him the hard-working, dedicated employee he is today.

Felipe savors working with people who change the way we view our world and the universe. Felipe said, "It is an honor to be part of an organization that continues to challenge the limits of science and exploration."

Felipe is involved in Grace Community Church in Fulton, Md. and Corner Stone Bible Church in Hanover, Md. Felipe lives in Laurel, Md. with his wife, Gabby, and their 2 children, Felipe and Jackie. ■

OutsideGoddard: The Color of Ice

By Elizabeth M. Jarrell

NASA geophysicist turned artist Peter J. Wasilewski sees the color of ice. "I want to make people see color in ice. The only way you can make ice expressive is through color," says Peter.

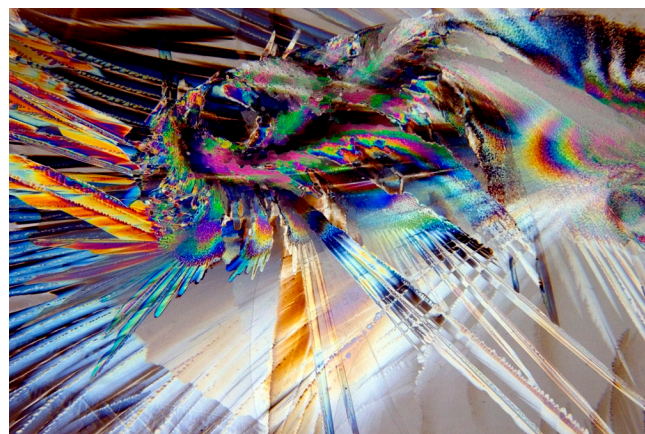
Why ice? Peter's first job as a scientist, and first trip outside of his local area, was to the Antarctic. He participated in a 1,000 mile traverse during which he measured the magnetic field and ice thickness. Since then, he has made a total of six trips to Antarctica. A volcano on the Antarctic Peninsula is named after him. Peter explains that "the Antarctic experience had a profound impact on me. Once I totally adapted to the cold, then I began to see and hear things. When the wind stops, there is no noise. I could actually hear my body work." He likens being in a white out to "being immersed in a cloud." He could not see where he was walking. The surface was defined by shadows. Peter insists that the experience is not one of sensory deprivation, but one of sensory enhancement. As a result, Peter "looks for what white ice can tell me, or what the wind-sculpted surface of the ice cap tells me. Wind becomes the artist."



Caption: Peter in Antarctica during the 1988-89 summer season.

Peter created an art form he calls *Frizion*, meaning "frozen vision." Frizion is based on the same techniques and principles that scientists use to study ice in Antarctica. Essentially, scientists make holes called ice cores deep into glaciers and ice caps, which are actually formed from crushed snowflakes compressed over time. These ice cores can reveal the atmospheric composition at the time the ice was formed hundreds or even thousands of years ago. According to Peter, "All of my art has its origins in science." However, the application of these techniques and principles to art is unique to him.

He begins by placing a small amount of water on its way to freezing in a glass Petri dish. He puts the Petri dish between two sheets of polarized filters. He then places the sandwich on a light table. Peter explains that "the color comes from the thickness of the ice." Other influences on the color are the time given to the water to begin freezing, different light sources, additional freezing mediums such as liquid nitrogen, and the level of water purity. Peter uses an inexpensive digital camera with 10X magnification to photograph the images and relies on Photoshop® to enhance the brightness but not the color. He relies on a high quality printer to produce images up to 30 by 40 inches. For Peter, "the composition configures the Frizion and is the most difficult part of the process." Peter concludes, "There are enormous landscapes and characters to see in a six inch diameter Petri dish."



Caption: "Frozen Sun."

Peter is careful to differentiate the scientist from the artist. For example, when Peter is asked how he names his images, he replies, "You have to realize that this is not scientific, this is artistic and the names emerge from perceptions and imagery. So what do the images look like?" Another example involves magnification. Peter's response is that "if I were publishing in a scientific journal, the magnification would be critical. But here, who cares? It's the composition that is most important here." Yet the scientist remains. When people ask Peter if he can freeze other fluids, they will be treated to a dissertation on the thirteen forms of water ice; only one form of which on Earth is hexagonal and is the only form able to produce both snowflakes and the color of ice.

Not too many individuals can be both a scientist and an artist. Explains Peter, "As I get older, I'm probably more of a nonlinear than a linear thinker. Science is creative. It's a different kind of creativity. I also think there are a lot of creative thinkers in technical areas who are able to make leaps in thinking." His scientific background makes him very particular about his art and the creative process. Says Peter, "Some days I wake up and can only write on yellow paper and with a certain kind of pen. It's the same way with my art. Some days I want to do a certain sort of picture. You have to make it speak to you. It's the material. You have to focus on it."

As an artist, Peter's Frizions have been on exhibit from Juno to Vail to Lake Placid. As a scientist, he is a standing guest lecturer for the annual Lake Placid History of Winter Program, which uses snow and ice as teaching tools to improve the quality of science teachers. He, however, has no plans to return to Antarctica; he prefers the comfort of a nice hotel with a good TV. Once he retires next month, he will convert to an Emeritus status as an educator focusing on the History of Winter Program. Peter now wants "to bring the color of ice to people who deal with ice in a scientific or artistic manner." In whatever his capacity; be he scientist, artist, or educator; Peter will continue exploring the color of ice.

For further information about Peter and his Frizions, visit:
<http://www.frizion.com>. ■

Hubble Gets a New Senior Project Scientist

By April Thornton

Jennifer Wiseman, Chief of the Exoplanets and Stellar Astrophysics Laboratory at NASA's Goddard Space Flight Center, was appointed the new *Hubble Space Telescope* Senior Project Scientist in August 2010.

Wiseman says she is honored and excited with her new position as communicator of *Hubble's* scientific discoveries to NASA and the public. "It is a wonderful time for *Hubble* science," she says. "Scientists around the world are elated because of the successful astronaut servicing mission of *Hubble* last year, which included the installation of two new outstanding science instruments on the observatory as well as the repair of two other malfunctioning instruments. This makes the observatory more powerful scientifically than ever," says Wiseman.

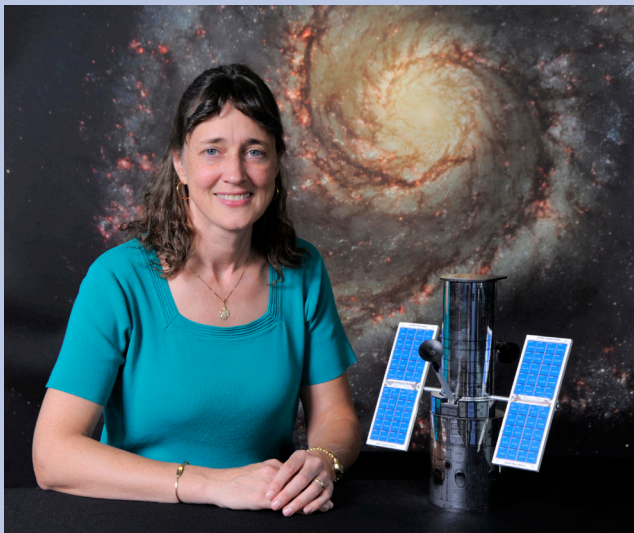


Photo credit: NASA/Goddard/Pat Izzo

Caption: Jennifer Wiseman.

Wiseman earned her bachelor's degree in physics from the Massachusetts Institute of Technology (MIT) in 1987 and her doctorate in astronomy from Harvard University in 1995. After graduation, she did six years of postdoctoral research, first as a Jansky Fellow and then as a *Hubble* Fellow, using radio and optical telescopes. Her research focused on how stars form in interstellar clouds. Wiseman recalls, "In one type of observational study I used *Hubble* to study how jets are ejected from the poles of newly forming stars as a critical stage in their formation."

She found an interest in science policy because she wanted to understand how the Nation incorporated and supported science. She was appointed as a Congressional Science Fellow for the American Physical Society, working

with the staff of the House Committee on Science. She was responsible for committee oversight of NASA's Earth and space science programs as well as the physics and astronomy programs of the National Science Foundation. Wiseman says that it was exciting work as it introduced to her how the Federal science agencies work together.

Her work on Capitol Hill led to a position in the Astrophysics Division at NASA Headquarters, where she served as the Program Scientist for the *Hubble Space Telescope* as well as for other missions and concepts, such as the Space Interferometry Mission (SIM) and the international Herschel Space Observatory.

She came to Goddard in 2006, where she was appointed Chief of the Laboratory for Exoplanets and Stellar Astrophysics. In this role, she supported and coordinated scientists who study stars, stellar evolution, and exoplanets, including the development of instruments and techniques for exoplanets detection and characterization.

Wiseman combines her love of doing exploratory research and astronomy outreach by being involved in NASA's missions and sharing the excitement of science and discovery with the public. She shares that *Hubble's* new instruments are improving the way scientists and the public understand the history of the universe. "The new *Hubble* instruments are allowing scientists to see infant galaxies that are apparent even just a few hundred million years after the beginning of the universe. *Hubble* is also enabling study of our own solar system, as well as the 'cosmic web' of material connecting galaxies," says Wiseman.

Nicholas White, Director of Sciences and Exploration Directorate said, "Jennifer has an uncanny ability to relate the complex science we do in a way that non-experts can understand. She also brings experience from public policy as well as science, which is an unusual combination, giving her a different perspective on why we do science and how to explain it to policy makers."

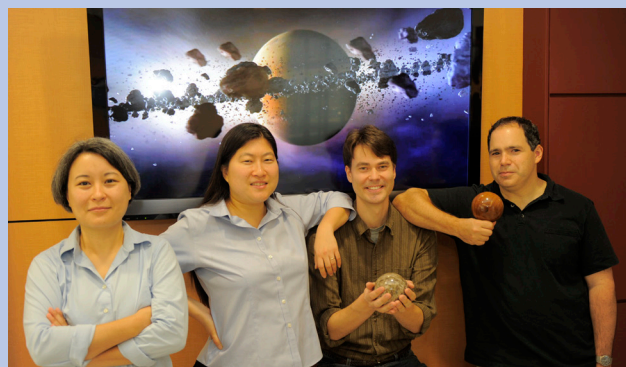
Wiseman says she is committed to help maximize the scientific return of *Hubble* in the years to come, as we look towards the eventual end of its mission. She emphasizes, "We want to make sure we accomplish the very best in scientific discovery, while *Hubble* continues as the world's forefront space observatory." ■

Exoplanet Club Celebrates Fifth Birthday

By Daniel Pendick

Boiling hot gas giants whirling around white dwarf suns. Vast disks of dust and asteroids glowing weakly in the infrared. Entire planets and moons spiraling helplessly into their own home stars. This is the stuff of science fiction, but also the topic of weekly discussion in Building 34 at the Exoplanet Club colloquium.

September 22, 2010 marked the five-year anniversary of Goddard's "Exoplanet Club" colloquium series. The series' current organizers—Marc Kuchner, Aki Roberge, Hannah Jang-Condell, and John Debes—are all active members of the Goddard Circumstellar Disks Group.



Caption: The current organizers of the Exoplanet Club colloquium series, from left to right: Aki Roberge, Hannah Jang-Condell, John Debes, and Marc Kuchner.

The disks of dust and gas that form around young "protostars" can eventually give birth to planetary systems. The Circumstellar Disks Group members look at various stages of that fundamental astrophysical process.

And the connection to disks and exoplanets? "Whenever you try to directly image a planet, you see a disk," says astrophysicist Kuchner. "If you work hard at it, you can see the planet, but it's easier to see dust."

The Disks group includes scientists from multiple divisions in the Sciences and Exploration Directorate (Code 600), but principally those in the Exoplanets and Stellar Astrophysics Laboratory in the Astrophysics Science Division.

Kuchner joined the Laboratory as a civil servant scientist five years ago. William Oegerle, the Division Chief, suggested he host the Exoplanet Club. Kuchner was a good fit for the job, since he had previously hosted colloquia and seminar series at Harvard University and Princeton University, where he had been a post-doctoral fellow.

Kuchner says that series like Exoplanet Club serve an important marketing function for scientists—especially those early in their careers.

"You're always a candidate for something," he explains. "You are either looking for a job or you're looking for collaborators or you're looking to be included on a proposal or you're looking to be invited to give a talk at a meeting. You're looking to have your proposals win. You're marketing yourself and your work."

Past speakers at the colloquium read like a *Who's Who* of exoplanet science. For instance, take David Bennett, who presented to Exoplanet Club on its fifth anniversary meeting.

Bennett is a Research Associate Professor in astrophysics and cosmology at Notre Dame University. He helped develop the use of gravitational microlensing as a technique for finding planets around other stars. He was a founding member of the MACHO (MASSive Compact Halo Objects) Project, which discovered the first known gravitational microlensing event in 1993. Exoplanet Club provides budding David Bennetts a forum to interact with key players in the field and hone their own ideas in open discussion.

Debes, a NASA Postdoctoral Program (NPP) fellow, and Jang-Condell, a NASA Michelson Postdoctoral Fellow, often present their current work to the group. So has Roberge, who originally came to Goddard as an NPP fellow, but was hired two years ago as a civil servant astrophysicist.

There is something in Exoplanet Club for non-scientists, too. It's the equivalent of at least a few college courses in the rapidly evolving field of stellar disk and exoplanet science.

Stop by some Wednesday for a taste. To paraphrase Groucho Marx, you might just care to belong to an Exoplanet Club that would gladly have you as a member.

To explore the Exoplanet Club colloquium schedule, visit:
<http://eud.gsfc.nasa.gov/Marc.Kuchner/exoplanetclub.html>.

To learn more about the Goddard Circumstellar Disks Group, visit:
http://science.gsfc.nasa.gov/667/disk_group.html. ■

Photo credit: NASA/Goddard/Pat Izzo